Remarks

The final Office Action dated August 8, 2008 listed the following rejections: claims 6-7, 10, 13-14, and 17 stand rejected under 35 U.S.C. § 103(a) over Rhee *et al.*(U.S. Patent No. 6,667,525) in view of Tao *et al.* (U.S. Patent No. 6,399,515); claims 8, 18 and 19 stand rejected under U.S.C. § 103(a) over Rhee in view of Tao and further in view of Lee *et al.* (U.S. Patent No. 6,172,399); claim 9 stands rejected under U.S.C. § 103(a) over Rhee in view of Tao and further in view of Gardner *et al.* .(U.S. Patent No. 6,160,300); and claims 11, 12 and 20 stand rejected under U.S.C. § 103(a) over Rhee in view of Tao and further in view of Sato *et al.* (U.S. Patent No. 5,290,712).

Applicant respectfully traverses the § 103(a) rejections of claims 6-14 and 17-20 because the cited portions of the Rhee reference do not correspond to the claimed invention which includes, for example, aspects directed to a second layer of gate material having a grain size that is at least twice as large as a grain size of a first layer of gate material. The cited portions of Rhee teach a gate that includes a lower layer 23 and an upper layer 24, with one of these layers having a grain size that is smaller than the grain size of the other layer. *See, e.g.,* Figure 3 and Col. 5:4-22. The cited portions of Rhee, however, do not teach any specific grain sizes for layers 23 and 24, or any relationship between how much larger the gain size of one of these layers is relative to each other. Accordingly, the § 103(a) rejections of claims 6-14 and 17-20 are improper and Applicant requests that they be withdrawn.

Applicant respectfully traverses the § 103(a) rejection of claims 8, 18 and 19 because the cited portions of the Lee reference do not teach that a doping implant in the activated gate material has an abruptness of a doping profile of about 2 nm or more (claim 8), of about 1.5 nm or more (claim 18), or of about 1 nm or more (claim 19). The cited portions of Lee discuss the abruptness of the junction dopant profile in a source/drain implant shallow junction (*see, e.g.,* Col. 1:41-58), instead of teaching that the abruptness of the doping profile in activated gate material is above a certain level as in the claimed invention. Moreover, Lee does not teach or suggest that modifying Rhee's layer 33 to have an abruptness of a doping profile of about 10 nm or less would result in "better threshold voltage roll-off characteristics"; instead the cited portions of Lee teach

that a source/drain junction profile abruptness of less than 10 nm addresses poor threshold voltage roll-off characteristics. Applicant submits that the cited portions of Lee concerning source/drain junctions are unrelated to the claimed invention, which includes aspects directed to the abruptness of the doping profile in a gate. Accordingly, the § 103(a) rejection of claims 8, 18 and 19 is improper and Applicant request that it be withdrawn.

Applicant respectfully traverses the § 103(a) rejection of claim 9 because the modification of the Rhee reference proposed by the Office Action renders Rhee unsatisfactory for its intended purpose. *See, e.g.,* M.P.E.P. § 2143.01 ("If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)"). The Office Action proposes to modify Rhee such that upper layer 24 of the gate is formed of amorphous silicon. The intended purpose of the Rhee reference, however, is to restrain the diffusion of Ge through the grain boundary from the lower layer 23 to the upper layer 24 by giving the lower layer 23 a columnar crystalline structure and the upper layer 24 random crystalline structure. *See, e.g.,* Col. 4:50 to Col. 5:22 and Figure 3. Applicant submits that replacing Rhee's random crystalline structure upper layer 24 with a layer of amorphous silicon would render Rhee unsatisfactory for restraining the diffusion of Ge through the grain boundary. As such, there is no motivation for the skilled artisan to modify Rhee in the manner proposed by the Office Action. Accordingly, the § 103(a) rejection of claim 9 is improper and Applicant requests that it be withdrawn.

Applicant respectfully traverses the § 103(a) rejection of claims 11, 12 and 20 because the cited portions of the Sato reference do not teach a gate electrode that includes a layer of gate material having a grain size of less than 5 nm (claim 12), that includes a layer of gate material having a grain size below about 30 nm (claim 20), or that includes a layer of gate material having a grain size below about 40 nm (claim 11). In fact, the purpose of the Sato reference is to obtain a crystalline film having a large grain size and in which the positions of the grain boundaries are controlled. *See, e.g.,* Col. 4:14-26. Sato's crystalline film is formed by depositing a polycrystalline film on a base material, then implanting Si ions into the film to make it amorphous, and followed by successive

heat treatments that are used to form the desired grain size, which is taught by Sato as being about 5 to 10 μm in size. *See, e.g.,* Col. 4:43-50, Col. 8:29-58 and Col. 11:9-11. The polycrystalline film relied upon by the Office Action to assert correspondence to the claimed invention is in fact the initial silicon film that is deposited on the based material and then used by Sato to produce the crystalline film having large grains. *See, e.g.,* Col. 8:29-58. As such, the cited portions of Sato teach forming a film having large grains (*e.g.,* 5 to 10 μm), with the polycrystalline film having grain sizes of 10 angstroms to a few hundred of angstroms simply being the starting material that is used to form the large grained film. In order words, Sato does not teach that the polycrystalline film having grain sizes of 10 angstroms to a few hundred of angstroms is part of a gate electrode.

Moreover, the broad range of grain size disclosed by the Sato reference (*i.e.,* 10 angstroms to hundreds of angstroms) is insufficient to anticipate a grain size of less than 5 nm, a grain size below about 30 nm, or a grain size below about 40 nm. According to M.P.E.P. § 2131.03 "If the claims are directed to a narrow range, >and< the reference teaches a broad range, ** depending on the other facts of the case, it may be reasonable to conclude that the narrow range is not disclosed with "sufficient specificity" to constitute an anticipation of the claims. **>See, e.g., *Atofina v. Great Lakes Chem. Corp*, 441 F.3d 991, 999, 78 USPQ2d 1417, 1423 (Fed. Cir. 2006)." As discussed above, the cited portions of the Sato reference do not teach using the polycrystalline film having grain sizes of 10 angstroms to a few hundred of angstroms as part of a gate electrode, and Sato does not provide any detail regarding why one of skill in the art would choose a grain size of the claimed invention. In addition, having a grain size of less than 5 nm results in a gate material that has certain desirable properties. *See, e.g.,* Paragraphs 0007 and 0041 of Applicant's specification.

In view of the above, the § 103(a) rejection of claims 11, 12 and 20 is improper and Applicant requests that it be withdrawn.

Applicant has added new claims 21-24. Applicant submits that claims 21-23, which depend from claim 6, are allowable over the cited references for at least the reasons discussed above. Applicant notes that claim 24 includes aspects directed to a gate that includes a first layer of gate material having a grain size of less than about 5 nm

and a second layer of gate material having a grain size of less than about 40 nm, which are not disclosed by the cited references as discussed above.

In view of the remarks above, Applicant believes that each of the rejections has been overcome and the application is in condition for allowance. Should there be any remaining issues that could be readily addressed over the telephone, the Examiner is asked to contact the agent overseeing the application file, Peter Zawilski, of NXP Corporation at (408) 474-9063 (or the undersigned).

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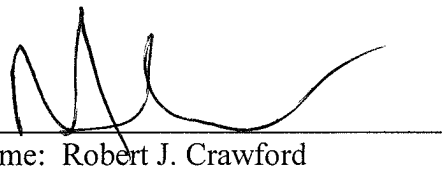
By: 

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